

6.4

Rhombuses, Rectangles, and Squares

- Goals**
- Use properties of sides and angles of rhombuses, rectangles, and squares.
 - Use properties of diagonals of rhombuses, rectangles, and squares.

VOCABULARY

Rhombus

Rectangle

Square

Example 1 Describing a Special Parallelogram

Decide whether the statement is *always*, *sometimes*, or *never* true.

- A square is a rectangle.
- A rectangle is a square.

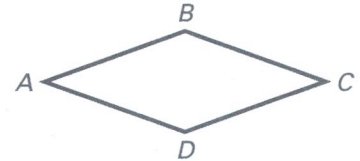
Solution

- The statement is _____ true. Because all squares have four _____, squares are _____ rectangles.
- The statement is _____ true. If a rectangle has four congruent _____, then it is also a square.

Example 2**Using Properties of Special Parallelograms**

$ABCD$ is a rhombus. What else do you know about $ABCD$?

- $ABCD$ has four congruent _____.
- Its opposite sides are _____.
- Its opposite angles are _____.
- Its diagonals _____.
- Its consecutive angles are _____.

**RHOMBUS COROLLARY**

A quadrilateral is a rhombus if and only if it has four congruent _____.

RECTANGLE COROLLARY

A quadrilateral is a rectangle if and only if it has four _____.

SQUARE COROLLARY

A quadrilateral is a square if and only if it is a _____ and a _____.

Example 3**Using Properties of a Rectangle**

In the diagram, $EFGH$ is a rectangle. What is the value of y ?

**Solution**

All four angles of a rectangle are _____. So, $m\angle G = \text{_____}^\circ$.

$$(7y + 6)^\circ = \text{_____}^\circ$$

Write equation.

$$7y = \text{_____}$$

Subtract _____ from each side.

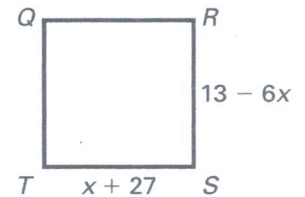
$$y = \text{_____}$$

Divide each side by _____.

1. A rhombus is a square.

2. A parallelogram is a rectangle.

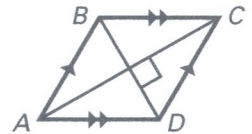
3. $QRST$ is a square. What is the value of x ?



THEOREM 6.11

A parallelogram is a rhombus if and only if its diagonals are _____.

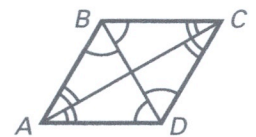
$ABCD$ is a rhombus if and only if _____ \perp _____.



THEOREM 6.12

A parallelogram is a rhombus if and only if each diagonal bisects a pair of opposite angles.

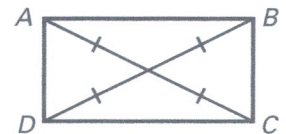
$ABCD$ is a rhombus if and only if
 \overline{AC} bisects \angle _____ and \angle _____ and
 \overline{BD} bisects \angle _____ and \angle _____.



THEOREM 6.13

A parallelogram is a rectangle if and only if its diagonals are _____.

$ABCD$ is a rectangle if and only if
_____ \cong _____.

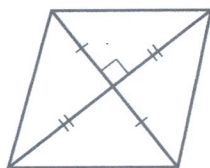


Practice A

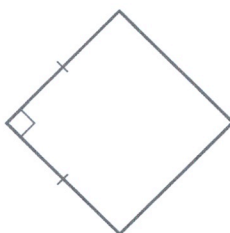
For use with pages 347–355

Each figure is a parallelogram. Identify the special type and explain your reasoning.

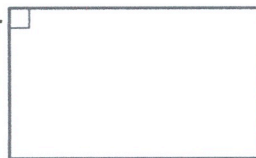
1.



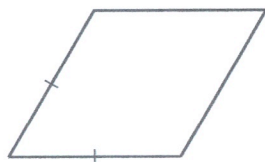
2.



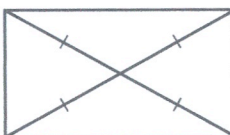
3.



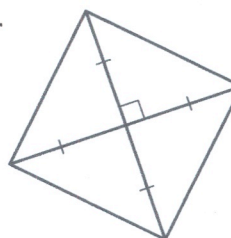
4.



5.



6.

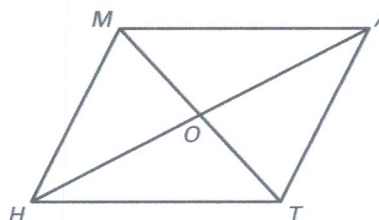


Match the properties of a quadrilateral with all of the types of quadrilateral which have that property.

- | | |
|--|------------------|
| 7. The diagonals are congruent. | A. Parallelogram |
| 8. Both pairs of opposite sides are congruent. | B. Rectangle |
| 9. Both pairs of opposite sides are parallel. | C. Rhombus |
| 10. All angles are congruent. | D. Square |
| 11. All sides are congruent. | |
| 12. Diagonals bisect the angles. | |

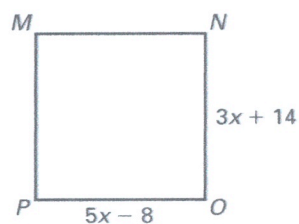
MATH is a parallelogram with diagonals intersecting at **O**. Identify the type depending upon the given conditions.

- | | |
|--|--|
| 13. $\overline{MT} \perp \overline{AH}$ | 14. $\overline{MT} \cong \overline{AH}$ |
| 15. $\overline{MA} \perp \overline{AT}, \overline{AM} \cong \overline{MH}$ | 16. $\overline{MO} \cong \overline{OT}, \overline{AO} \cong \overline{OH}$ |

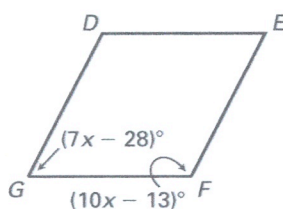


Find the value of x .

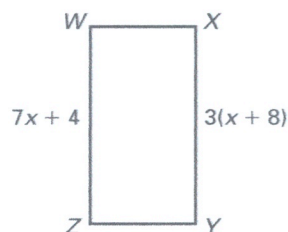
17. $MNOP$ is a square.



18. $DEFG$ is a rhombus.



19. $WXYZ$ is a rectangle.



quadrilateral with four right angles and four congruent sides. A square is both a rectangle and a rhombus. Rectangles, rhombi, and squares are all examples of parallelograms.

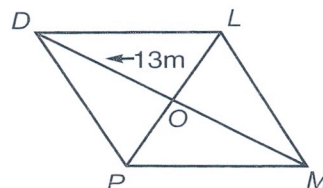
Rectangles	Rhombi
<ul style="list-style-type: none"> • Opposite sides are congruent. • Opposite angles are congruent. • Consecutive angles are supplementary. • Diagonals bisect each other. • All four angles are right angles. • Diagonals are congruent. 	<ul style="list-style-type: none"> • Diagonals are perpendicular. • Each diagonal bisects a pair of opposite angles.

Determine whether each statement is always, sometimes, or never true.

1. The diagonals of a rectangle are perpendicular.
2. Consecutive sides of a rhombus are congruent.
3. A rectangle has at least one right angle.
4. The diagonals of a parallelogram are congruent.
5. A diagonal of a square bisects opposite angles.

Use rhombus DLMP to determine whether each statement is true or false.

6. $OM = 13$
7. $PL = 26$
8. $\overline{MD} \cong \overline{PL}$
9. $m\angle DLO = m\angle LDO$
10. $\angle LDP \cong \angle LMP$
11. $m\angle DPM = m\angle PML$



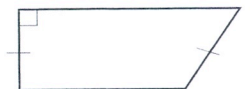
NAME _____

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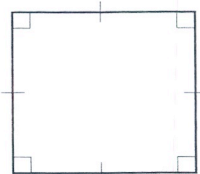
PERIOD _____

Rectangles, Rhombi, and Squares

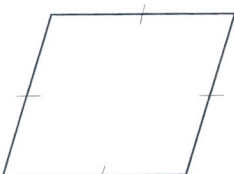
Identify each parallelogram as a rectangle, rhombus, square, or none of these.



1.



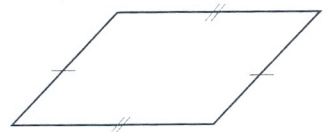
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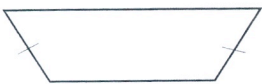
3.



5.



4.



6.

7. BO

9. AC

11. $m\angle AOB$

13. $m\angle ADB$

15. MG

17. $m\angle FHG$

19. $m\angle EMF$

21. EF

8. OC

10. BD

12. $m\angle ABC$

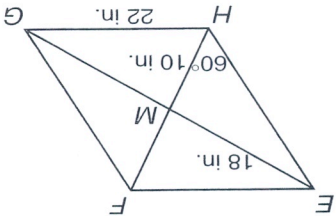
14. $m\angle DCA$

16. HF

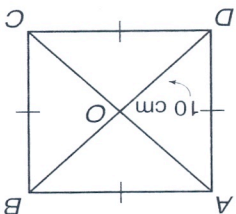
18. $m\angle FEH$

20. FG

22. $m\angle FGE$



Exercises 15 - 22



Exercises 7 - 14